

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



**SAULT  
COLLEGE**

**COURSE OUTLINE**

<b>COURSE TITLE:</b>	DIESEL FUEL/EMISSIONS SYSTEMS		
<b>CODE NO. :</b>	MPT232		TWO
<b>PROGRAM:</b>	Motive Power Technician – Advanced Repair		
<b>AUTHOR:</b>	Group 2014		
<b>DATE:</b>	January 2015	<b>PREVIOUS OUTLINE DATED:</b>	January 2014
<b>APPROVED:</b>	<i>“Corey Meunier”</i> CHAIR		Jan '16  DATE
<b>TOTAL CREDITS:</b>	3		
<b>PREREQUISITE(S):</b>	MPF103 and MPF124		
<b>HOURS/WEEK:</b>	6		

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School of The Natural Environment, Technology & Skilled Trades  
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**I. COURSE DESCRIPTION:**

In this course students will learn the construction, operation, testing and servicing of Port Helix Mechanical diesel fuel injection systems, inlet metering and sleeve metering injection systems and their related sub system components. Emphasis will be put on the operation, testing and servicing of these systems. Students will also be taught about the beginning and progression of Computer Controlled Electronic Diesel Injection systems and learn how input and output components were adapted to control the air and fuel requirements for the diesel engines. Emphasis will be put on the changes to the engine and combustion systems to reduce output emissions to meet government regulations from the early standards to the current industry standards. Students will be taught the operation, testing and servicing of these systems using electronic test tools and specific manufacturers diagnostic systems

Students will be required to follow proper safety procedures when performing the above tasks according to both Sault College Motive Power Department Standards and Vehicle Manufacturers safety regulations and specifications.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

**1. *Describe, identify and test the components in a hydro-mechanical port helix injection system.*****Potential Elements of the Performance:**

- List and describe the components required to supply and control the air and fuel requirements to the engine for startup, idle, rated speed, deceleration, high idle and emission conditions.
- Describe the component and function of the low pressure supply system.
- List and describe the operation of the components of the high pressure injection system.
- Test the low pressure supply system.
- Diagnose faulty mechanical injectors
- Remove, install and time a port helix injection pump
- Inspect the timing advance mechanism of a inline mechanical injection pump.

**2. *Differentiate the differences in operation of inlet metering and sleeve metering types of rotary diesel injection pumps and the differences in components.***

Potential Elements of the Performance:

- Describe the difference in operation between the inlet metering pump and the sleeve metering injection pump.
- Test the supply system on a rotary injection pump
- Remove, install and time a rotary injection pump to an engine.

**3. *Define the role of computer controlled electronic diesel fuel injection systems and perform diagnostic procedures.***

Potential Elements of the Performance:

- Identify the differences between partial authority and full authority electronic engine management systems.
- Describe the construction and operation of input and output devices.
- Describe how an ECM processes inputs and uses programmed data to generate outputs.
- Utilize electronic service tools to extract data
- Diagnose system codes.
- Capture a vehicle data log and analyze results.

**4. *Diesel Fuel Injection Nozzles***

Potential Elements of the Performance:

- Describe the principal of operation and purpose of hydro-mechanical injectors
- Describe the principles of operation of electro-hydraulic, electronic unit injector and piezoelectric injectors.
- Remove and bench test (pop) a hydraulic injector nozzle and reinstall.
- Perform a balance test on electronic injectors using the electronic test tool and manufactures software program.
- Remove and replace a mechanical injector.
- Diagnose a faulty injector.

**5. *Diesel Engine Emission Systems and Regulations***

Potential Elements of the Performance:

- Define the types of emission produced by diesel engine combustion.
- List the components used to reduce and control the output of emissions
- List the limit for output of oxides of nitrogen (NOX) according to government regulations.

- Describe the method of testing for particulate matter on the diesel engine.
- Perform a SAE J1667 opacity smoke test procedure and correlate test failures to an engine or management malfunction.
- Outline the operating principals of EGR valves, diesel particulate filters and catalytic converters.

#### 6. **Diesel Engine Governors**

##### Potential Elements of the Performance:

- Define the function of the diesel engine governor
- Identify the different types of engine governors
- Describe the operation of a Variable speed governor, a limiting speed governor and a isochronous governor.
- Diagnose the symptoms of a faulty governor.

### III. TOPICS:

1. Hydro-mechanical Port Helix Injection Pumps.
2. Inlet metering and sleeve metering rotary injection pumps.
3. Computer controlled electronic diesel engine systems.
4. Diesel Fuel Injection Nozzles.
5. Diesel engine emissions.
6. Diesel engine governors.

### IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

#### **Medium, Heavy Duty Truck Engines, Fuel & Computerized Management Systems, 4<sup>th</sup> Edition**

*The following items are mandatory for entrance to the Shop:*

- *Approved coveralls*
- *CSA approved safety boots (6 inch or higher only)*
- *CSA approved safety glasses*
- **NO CELL PHONES**

*Clip board/pens/pencils*

**V. EVALUATION PROCESS/GRADING SYSTEM:**

The final grade for this course will be based on the results of classroom, assignments and shop evaluations weighed as indicated:

- Classroom – 45% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised of a number of technical reports
- Shop – 35% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude
- Employability Skills – 10% of final grade is comprised of attendance, class participation, show ability to follow direction and being a team player.

**(Student will be given notice of test and assignment dates in advance)**

The following semester grades will be assigned to students:

<b>Grade</b>	<b><u>Definition</u></b>	<i>Grade Point Equivalent</i>
A+	90 – 100%	
A	80 – 89%	4.00
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

**VI. SPECIAL NOTES:**Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

***It is the departmental policy that once the classroom door has enclosed, the learning process has begun. Late arrivers will not be granted admission to the room.***

**VII. COURSE OUTLINE ADDENDUM:**

The provisions contained in the addendum located on the portal form part of this course outline.